

# **[AGREEMENT]**

## **Concerning the Coordination between U.S. Satellite Digital Audio Radio Service and Canadian Fixed Service and Mobile Aeronautical Telemetry Service in the band 2320-2345 MHz**

### **Introduction**

This document describes an [Agreement] between the Federal Communications Commission (FCC), U.S.A. and the Department of Industry Canada (IC), concerning the coordination between U.S. satellite DARS (BSS(sound)) and Canadian Fixed Services (FS) and Mobile Aeronautical Telemetry Systems (MATS) in the band 2320-2345 MHz.

### **Background**

Bilateral meetings between FCC and IC to discuss satellite DARS/FS/MAT coordination at 2320-2345 MHz began in September 1995. Discussions were based on four proposals in the U.S. to provide satellite DARS from 2320-2345 MHz and proposed service rules. The FCC adopted final service rules and a licensing selection method for U.S. satellite DARS on March 3, 1997. In April 1997, it auctioned 25 MHz of spectrum for two licenses for satellite DARS in the 2320-2345 MHz band. Two licenses have since been granted to the auction winners and ITU-R APS4/II information for coordination has been provided to the ITU based on these licenses.

The majority of Canadian fixed point-to-point systems are currently licensed in channels at 2326 MHz and below. In addition, a number of Canadian MATS systems also operate in the 2320-2345 MHz band and are expected to be subject to interference from DARS emissions. The U.S. recognizes that DARS satellite transmissions and MAT operations are generally incompatible on a co-frequency, co-coverage basis. IC has also expressed its view that it would be difficult for it to accept power flux-density (pfd) constraints higher than the -144/-154 dB(W/m<sup>2</sup>/4kHz) (ref. RR No. 2556) on the entire 50 MHz of DARS spectrum and it has therefore requested that the U.S. identify the minimum amount of spectrum required for DARS.

### **Satellite DARS in the U.S.**

One satellite DARS system is licensed by the U.S. to operate in 12.5 MHz of spectrum from 2320-2332.5 MHz. A second satellite DARS system is licensed in the 12.5 MHz of

spectrum from 2332.5-2345 MHz. Feeder links for both systems will be implemented in the band 7025-7075 MHz. The license term for U.S. space systems is 8 years but the expected lifetime of first generation U.S. satellite DARS systems is 15 years and it is likely that the license terms will be extended or renewed to reflect actual lifetime. Though outside of the scope of this [Agreement] which pertains to the 2320-2345 MHz band, the U.S. has developed service rules and issued licenses for Wireless Communication Services (WCS) in portions of the S-band where Canadian FS and MAT systems operate. WCS licensees are permitted to offer satellite DARS in the 2310-2320 MHz and 2345-2360 MHz bands consistent with the ITU Radio Regulations and the FCC Rules. Satellite DARS use of the WCS spectrum would require a separate coordination agreement between the Administrations.

The service area for satellite DARS systems will include the 48 CONTiguous United States (CONUS) Alaska, Hawaii, and Puerto Rico/Virgin Islands. The maximum pfd level required in the service area of the satellite systems is  $-119 \text{ dB(W/m}^2\text{/4kHz)}$ . The use of terrestrial repeaters, operating within the same spectrum as the licensed space station is anticipated by the licensees to fill in, but not to extend, the satellite footprint where necessary. However, the FCC has not issued final rules for these repeaters. Protection of satellite DARS reception from unacceptable interference from FS and MAT transmitters operating in Canada will be necessary.

### **FS/MAT in Canada.**

Current Canadian operations in the 2290-2360 MHz band consists of low capacity point-to-point and subscriber radio systems where a requirement for large or high performance antennas would not be practical. For new systems, while there is some flexibility in the site location and pointing of point-to-point systems, with point-to-multipoint systems there are fewer options to avoid interference. Constraints of a higher value of pfd will limit the use of frequencies in certain areas corresponding to the coverage of the particular co-frequency satellite DARS beam. In addition, a requirement to protect satellite DARS receivers from interference could place operational constraints on Canadian FS use in the border area.

There will be an increased demand for low-capacity fixed systems in the band for services that have been displaced by other newer Canadian services. For example low capacity point-to-point systems will be displaced by PCS and T-DAB. New applicants and licensees have been encouraged to use the lower channels first as an interim measure but this has resulted in more difficult domestic coordination, since the heaviest population of existing FS systems is currently in the lower part of the band. In Canada the frequency bands available for MAT includes the 2320-2345 MHz band and a number of systems are currently in operation.

## **The [Agreement]**

### **System Characteristics.**

This [Agreement] establishes sharing conditions between U.S. Satellite DARS and Canadian fixed and mobile systems in the 2320-2345 MHz band. The relevant system characteristics are contained in U.S. information filed with the ITU Radiocommunication Bureau and Canadian information contained in the Appendix. The Appendix includes the current ITU APS4/II information that has been provided by the United States to the ITU (identified as USASAT-28C, USASAT-28D, USASAT-28E, USASAT-28F, and USASAT-28G), and a current listing of Canadian FS/MAT systems (entitled "Existing Canadian FS/MAT systems). The U.S. agrees to supply Canada any ITU APS4/II modifications when sent to the ITU. Any changed parameters of the ITU APS4/II information filed by the U.S. for U.S. satellite DARS systems prior to their launch – with the exception of the pfd specified in the next section – will become effective immediately.

### **Satellite DARS pfd Level and EIRP Contours.**

The maximum satellite DARS pfd level for any angle of arrival will not be greater than  $-119 \text{ dB(W/m}^2\text{/4kHz)}$  in the 2320-2345 MHz band. Coordination under this [Agreement] is based on the maximum pfd value of  $-119 \text{ dB(W/m}^2\text{/4kHz)}$  along with other relevant parameters derived from the current ITU information as filed with the Radiocommunication Bureau (for the U.S. systems) and the information contained in the Appendix (for Canadian systems).–PFD derivation is based on the power density specified over a 4kHz bandwidth at the input to the satellite transmit antenna and the satellite transmit antenna equi-gain contours relative to maximum gain specified in 2 dB increments up to 10 dB (and in 10 dB increments thereafter as specified in the information as filed with the Radiocommunication Bureau) and the spreading loss due to the altitude and slant range of the individual space stations. However to facilitate the evaluation of the DARS satellite impact on Canadian FS and MATS systems, the DARS transmit antenna equi-gain contours in the range -10 to -20 dB will be supplied in 2 dB increments.

### **U.S. Satellite DARS spectrum and service area.**

This [Agreement] provides for the operation of two satellite DARS systems consisting of the networks designated as USASAT-28C, USASAT-28D, USASAT-28E, USASAT-28F, and USASAT-28G. The pertinent characteristics of these satellite DARS systems are specified in the information filed with the Radiocommunication Bureau, the current version of which is contained in the Appendix. One U.S. satellite DARS system will

-1

operate in the 12.5 MHz of spectrum from 2320-2332.5 MHz (at present, USASAT-28C or both USASAT-28D and USASAT-28E) and a second system will operate in the band 2332.5-2345 MHz (at present, USASAT-28F and USASAT-28G). The service area for the licensed satellite DARS systems includes the 48 CONTiguous United States (CONUS). Service to Alaska, Hawaii, and Puerto Rico/Virgin Is. is also permitted. It is understood that U.S. satellite DARS licensees do not intend to provide service to Canadians in Canada. Therefore, spillover of satellite DARS signals should be minimized to the extent practical.

### **New Canadian Fixed Systems.**

For the purpose of this [Agreement], new Canadian fixed systems are defined as systems licensed after the date that this [Agreement] is signed, including existing systems which are modified in such a manner that interference potential increases.

New Canadian fixed systems will not claim protection from U.S. satellite DARS systems operating in accordance with this [Agreement].

New Canadian fixed systems in the 2320-2345 MHz band shall not exceed a pfd of -155 dB(W/m<sup>2</sup>/4kHz) at U.S. satellite DARS receivers, within the United States.

### **Existing Canadian Fixed and Existing and Future MATS Systems.**

For the purpose of this [Agreement] the existing fixed and MATS systems are described in the Appendix.

In order to provide the maximum possible transition period for existing fixed and MATS systems operating in Canada in accordance with existing Agreements, existing fixed and existing MATS systems in Canada will be protected from interference from U.S. satellite DARS systems for a minimum of 18 months after the date that this [Agreement] is signed. Launch and operational testing of the first DARS satellites is expected to be as early as 18 months after the date that this [Agreement] is signed. Existing fixed and existing and future MATS systems in Canada may be afforded protection for a transition period not to exceed a maximum of 24 months after the date that this [Agreement] is signed, depending upon the actual launch and operational testing dates of the DARS satellites. To facilitate the transition process, the FCC agrees to provide information concerning launch, operational testing, and in-service dates of the satellite DARS systems referred to in this [Agreement]. After the end of the transition period, if any, existing fixed and MATS systems in Canada will not claim protection from the U.S. satellite DARS systems operating in accordance with this [Agreement].

Existing and Future MATS systems in Canada (after 18 months plus the end of the

transition period, if any) will both:

- (1) not claim protection from U.S. satellite DARS; and
- (2) either be moved out of the 2320-2345 MHz band entirely, or not be utilized within line of sight (considering the altitude of the MATS transmitter) of the U.S. border.

In cases where satellite DARS systems are brought into service prior to 24 months after the date that this [Agreement] is signed, it is understood that operators of the satellite DARS systems and the operators of affected existing fixed terrestrial systems in Canada will develop mutual Arrangements, to address potential interference situations.

#### **Satellite DARS feeder links.**

The U.S. will license its satellite DARS feeder links in the band 7025-7075 MHz. It is agreed that coordination of the satellite DARS Feeder Link Earth stations will be conducted using the routine ITU process (e.g. Appendix 28 and relevant ITU-R Recommendations). The U.S. agrees to provide appropriate ITU information to IC as it becomes available.

#### **Cross-polarization.**

U.S. satellite DARS operators are permitted to use circular cross-polarization within their assigned spectrum.

#### **Satellite DARS Terrestrial Repeaters.**

It is anticipated that, subject to completion of the FCC rulemaking process, satellite DARS operators will be permitted to construct and operate terrestrial transmitters under the following conditions:

- 1) the terrestrial repeaters will be used to retransmit signals received from their operating DARS satellites on the exclusive frequency assignment of the licensee and for use of the same bandwidth as the satellite space stations;
- 2) the terrestrial repeaters shall not be used to extend satellite DARS coverage outside of the satellite systems' authorized service area;
- 3) the two Administrations agree that coordination of terrestrial repeaters is not necessary provided that the individual repeaters do not exceed a power flux density of  $-119 \text{ dB(W/m}^2\text{/4kHz)}$  at and beyond the common border.

The pfd limit applies to all land areas, including islands, lying within the U.S. territories. Computations of the pfd shall be based on calculations taking account of available intervening terrain propagation loss (shielding) of a satellite DARS repeater, if any, plus free space calculations as described below:

$$\text{pfd(dBW/m}^2\text{)} = 10\log(\text{EIRP}/4\pi D^2);$$

Where:

EIRP = 1.64xERP

EIRP is the power relative to an isotropic radiator in Watts at the azimuth of interest;

ERP is the power relative to a dipole in Watts at the azimuth of interest.

If the terrestrial repeater pfd threshold is exceeded, the assignment shall be subject to coordination on a case-by-case basis.

The U.S. agrees to provide IC with the operating parameters of all new or modified satellite DARS terrestrial repeater assignments which exceed the agreed pfd value. The information which will be provided to IC includes:

- Location (Community/State);
- Geographic coordinates of transmitting antenna;
- EIRP (including line loss) value;
- Ground elevation and antenna height above ground;
- Center frequency;
- Polarization;
- Antenna pattern/tabulation of the pattern (if requested);
- Azimuth of the main lobe;
- Frequency stability of the transmitter;
- Bandwidth and Emission designation.

Canada and the U.S. agree to notify the ITU that the coordination of the subject networks is completed under this [Agreement]. It is understood that this [Agreement] can be reviewed at the request of either party.